FIG.1A Amino Acid Sequence of the Composite  $HCV_{HC-J1/CIIC/CHI}$ 

15 10 Met Ser Thr Ile Pro Lys Pro Glin Arg Lys Thr Lys Arg Ash Thr Ash Ang Ang Pro Glin Asp Yai Lys Phe Pro Gly Gly Gly Glin Ile Va. Gly Gly Val Tyr Leu Leu Pro Arg Gly Pro Arg Leu Gly Val Arg Ala Thr Ang Lys Thr Ser Glu Ang Ser Glin Pro Ang Gly Ang Ang Glin Pro Ile Pro Lys Val Ang Ang Pro Glu Gly Ang Thr Trp Ala Gin Pro Gly Tyr Pro Trp Pro Leu Tyr Giy Ash Giu Gly Cys Gly Trp Ala Gly Trp Leu Leu Ser Pro Ang Gly Ser Ang Pro Ser Trp Gly Pro Thr Asp Pro 97 113 And And And Sen and Ash Leu Giy Lys Val Ite Asp Thr Leu Thr Cvs Gly Phe Ala Aso Leu Met Gly Tyr Ile Pro Leu Val Gly Ala Pro Leu 129 145 Gly Gly Ata Ala Ang Ata Leu Ala His Gly Val Ang Val Leu G u Aso Gly Val Ash Tyr Ala Thr Gly Ash Leu Pro Gly Cys Sen Phe Sen 161 Phé Leu Leu Ala Leu Leu Ser Cys Leu Thr Val Pro Ala Ser Ala Tyr 177 193 Glin Vall AngliAsh Sen Thr Gly Leu Tyr His Val. Thr Ash Ase Cys Pho Ash Ser Ser Ite Val Tyr Giu Ala His Ash Ala Ite Leu His Trr Pro 509 Gly Cys Val Pro Cys Val Ang Siu Gly Ash Val Ser Ang Cys Tho Val 225 Ala Met Thr Pro Thr Var Ala Thr Ang Aso Gly Lys Leu Pro Ala Thr 241 Glin Leu Ang Ang His Ite Asp Leu Leu Val. Ety Sen Ata Thin Leu Cys 257 Sen Ala Leu Tyn Val Gly Asp Leu Cys Gly Sen Val Phe Leu ile Gly 273 Gin Leu Phe Thr Phe Ser Pro Arg Arg His Trp Thr Thr Gin G / 289 305 Ash Cys Ser Ile Tyr Pro Gly His Ile Thr Gly His And Met Ala Trp Asp Met Met Ash Tho Ser Pro Thr Ala Ala Leu Val Met Ala Gin 321 Leu Leu Ang Ile Pro Gin Ala Ile Leu Asp Met Ile Ala Gly Ala His 337 Trp Gly Val Leu Ala Gly Ite Ata Tyr Phe Ser Met Val Gly Ash Tho 353 Ala Lys Val Leu Va. Val Leu Leu Leu Phe Ala Gly Val Aso Ala Glu 369 Thr Ite Val Ser Gry Gry Gin Ala Ala Ang Ala Met Ser Gry Leu Val 385 401 Ser Leu Phe Thr Pro Gly Ala Lys Gln Ash Ile Gin Leu Ile Ash Thr Ash Gly Ser Trp His Ile Ash Ser Thr Ala Leu Ash Cys Ash Glu Ser 417 433 Leu Asn Thr Gly Trp Leu Ala Gly Leu Ile Tyr Gln His Lys Phe Asn 449 Ser Ser Gly Cys Pro Giu Arg Leu Ala Ser Cys Arg Pro Leu Thr Asp Phe Asp Gln Gly Tro Gly Pro Ile Ser Tyr Ala Ash Gly Ser Gly Pro 465 481 Asp Gln Ang Pro Tyr Cys Trp His Tyr Pro Pro Lys Pro Cys Gly I'e Val Pro Ala Lys Ser Val Cys Gly Pro Val Tyr Cys Phe Thr Pro Ser 497 513 Pro Val Val Val Gly Thr Thr Asp Arg Ser Gly Ala Pro Thr Tyr Ser 529 Trp Gly Glu Ash Asp Thr Asp Yal Phe Val Leu Ash Ash Thr Ang Pho Pro Leu Gly Asn Trp Phe Gly Cys Thr Trp Met Asn Ser Thr Gly Phe 545 561 Thr Lys Val Cys Giy Ala Pro Pro Cys Val Ile Gly Gly Ala Giy Asn Asn Thr Leu His Cys Pro Thr Asp Cys Phe Arg Lys His Pro Asp Ala 577 593 Thr Tyr Ser Arg Cys Giy Ser Gly Pro Trp Ile Thr Pro Arg Cys Leu 609 Val Asp Tyr Pro Tyr Ang Leu Trp His Tyr Pro Cys Thr Ite Asn Tyr Thr Ile Phe Lys Ile Arg Met Tyr Val Gly Gly Val Glu His Arg Leu 625 Glu Ala Ala Cys Asn Tro Thr Arg Gly Glu Arg Cys Asp Leu Glu Asp 657 Ang Asp Ang Sen Glu Leu Sen Pro Leu Leu Ibr Thr Thr Gin Trp 673 Gln Val Leu Pro Cys Ser Phe Thr Thr Leu Pro Ala Leu Ser Thr Gly Leu Ile His Leu His Gin Asn Ile Val Asp Val Gln Tyr Leu Tyr Gly Val Gly Ser Ser Ile Ala Ser Trp Ala Ile Lys Trp Glu Tyr Val Val

## FIG.1B

Leu Leu Phe Leu Leu Leu Ala Asp Ala Arg Val Cys Ser Cys Leu Trp 721 Met Met Leu Leu Ire Sen Sin Ala Glu Ala Ala Leu Glu Asn Leu Val Ile Leu Asn Ala Ala Ser Leu Ala Gly Thr His Gly Leu Vai Ser Phe 753 Leu Val Phe Phe Cys Phe Ala Trp Tyr Leu Lys Gly Lys Trp Val Pro Gly Ala Val Tyr Thr Phe Tyr Gly Met Trp Pro Leu Leu Leu Leu Leu 785 Leu Ala Leu Pro Gir Arg Aia Tyr Ala Leu Asp Thr Giu Val Ala Ala Ser Cys Giy Giy Val Val Leu Val Giy Leu Met Ala Leu Thr Leu Ser 801 817 Pro Tyr Tyr Lys Ang Tyr Ile Ser Trp Cys Leu Trp Trp Leu Gin Tyr Phe Leu Thr Ang Val Glu Ala Glr Leu His Val Trp Ile Pro Pro Leu 833 849 Ash Val Ang Gly Gly Ang Asp Ala Val The Leu Leu Met Cys A a Val 865 His Pro Thr Leu Va Phe Asp Ile Thr Lys Leu Leu Leu Ala Va. 881 Gly Pro Leu Trp Ile Leu Aso Ala Sen Leu Leu Lys Va Pro Tyr Phe 897 Val Ang Val Gin Gry Leu Leu Ang Phe Cys Ara Leu A a Ang Lys Met 913 Ite Gly Gly His Tyn 12 3 h Met /al I e Ile Lys Leu Gry A a Leu 929 Thr Gly Thr Tyr Va Tyn Ash His Leu Thn Pho Leu Ang Asp Tho Ala 945 His Ash Gly Leu Ang Aso Leu Ala Vai Ala Vai Glu Pho Vai Vai Phe 961 Ser Gin Met Giu Thr Lys Leu Ite Thr Tho Gly Ala Asp Thr Ala Ala Cys Gly Asp Ite Ite Ash Gly Leu Pho Val Ser Ala Ang Ang Gly Ang 977 993 Glu Ilê Leu Leu Siy Pho Ala Asp Siy Met Val Sen Lys Siy Tro Ang 1009 Leu Leu Ala Pro Ile Thr Ala Tyr Ala Gin Gin Thr Ang Gly Leu Leu 1025 Gly Cys Ile Ile Thr Ser Leu Thr Gly Ang Aso Lys Ash Glin Val Glu 1041 Sen Thr Ala 4 a Glin Thr Phe Leu Ala Thr Giv Glu Val Glr I.e Va 1057 Cys Ile Ash Gly Val Cys Tho Thr Val Tyr His Gly Ala Gly Thr Ang 1073 The Ite Ata Ser Pro Lys Gly Pro Val Ite Gle Met Tyr The Ash Val Asp Gle Asp Leu Val Gly Tro Pro Ata Pro Gle Gly Ser Ang Ser Leu 1089 1105 Thr Pro Cys Thr Cys Gily Ser Ser Aso Leu Tyr Leu Val Thr Ang His 1121 Ala Asp Val Ile Pro Val Ang Ang Ang Gly Asp Sen Ang Gly Sen Leu 1137 Leu Ser Pro Ang Pro I.e Ser Tyr Leu Lys Gly Ser Ser Gly Gly Pro 1153 Leu Leu Cys Pro Ala G.y H.s Ala Val Giy Ile Phe Arg Ala Ala Val Cys Thr Arg Gly Val A.a Lys Ala Val Aso Phe Ile Pro Val Glu Asn 1185 Leu Glu Thr Thr Met Ang Ser Pro Va. Phe Trp Asp Asn Ser Ser Pro 1201 Pro Val Val Pro Gln Ser Phe Gln Val Ala His Leu His Ala Pro Thr 1217 Gly Ser Gly Lys Ser Thr Lys Val Pro Ala Ala Tyn Ala Ala Gin Gly 1233 Tyr Lys Val Leu Val Leu Asn Pro Ser Val Ala Ala Thr Leu Gly Phe 1249 Gly Ala Tyr Met Ser Lys Ala His Gly Ile Asp Pro Asn Ile Arg Thr 1265 Gly Val Ang Thr Ile Thr Thr Gly Ser Pro Ile Thr Tyr Ser Thr Tyr 1281 Gly Lys Phe Leu Ala Aso Gly Gly Cys Ser Gly Gly Ala Tyr Asp Ile 1297 Ile Ile Cys Asp Glu Cys His Ser Thr Asp Ala Thr Ser Ile Leu Gly 1313 Ile Gly Thr Val Leu Ass Gin Ala Glu Thr Ala Gly Ala Arg Leu Val 1329 Val Leu Ala Thr Ala Thr Pro Pro Gly Ser Val Thr Val Pro His Pro 1345 Asn Ile Glu Glu Va! Ala Leu Ser Thr Thr Gly Glu Ile Pro Phe Tyr 1361 Gly Lys Ala Ile Pro Leu Giu Val Ile Lys Gly Gly Arg His Leu Ile 1377 Phe Cys His Ser Lys Lys Lys Cys Asp Giu Leu Ala Ala Lys Leu Val 1393 Ala Leu Gly Ile Ash Ala Val Ala Tyn Tyn Ang Gly Leu Asp Val Sen 1409 Val Ile Pro Thr Ser Gly Asp Val Val Val Val Ala Thr Asp Ala Leu 1425

## FIG.1C

Met Thr Gly Tyr Thr Gly Asp Phe Asp Ser Val Ile Asp Cys Asn Thr Cys Val Thr Gin Thr Val Asp Phe Ser Leu Asp Pro Thr Phe Thr Ile Glu Thr Ile Thr Leu Pro Gln Aso Ala Val Ser Arg Thr Gln Arg Arg 1473 Gly Arg Thr Gly Arg Gly Lys Pro Gly Ile Tyr Arg Phe Val Ala Pro 1489 Gly Glu Ang Pro Ser Gly Met Phe Asp Ser Ser Val Leu Cys Glu Cys 1505 Tyr Asp Ala Gly Cys Ala Trp Tyr Glu Leu Thr Pro Ala Glu Thr Thr 1521 Val Ang Leu Ang Ala Tyr Met Asn Thr Pro Gly Leu Pro Val Cys Gln 1537 Asp His Leu Glu Phe Trp Glu G y Val Phe Thr Gly Leu Thr His Ile 1553 Aso Ala His Phe Leu Ser Gln Thr Lys Gly Ser Gly Glu Asn Leu Pro 1569 Tyr Leu Val Ala Tyr Gin Ala Trr Va' Cys Ala Arg Ala Gin Ala Pro 1585 Pro Pro Ser Tho Aso Gin Met Tho Lys Cys Leu Ile Ang Leu Lys Pro 1601 Thr Leu His Gly Pro Thr Pro Leu Leu Tyr Ang Leu Gly Ala Val Gin 16:7 Ash Glu Ile Thr Leu Thr His Pro Val Thr Lys Tyr Ile Met Thr Cys 1633 Met Sen Ala Aso Leu Glu Val Va Thr Sen Thr Tho Val Leu Val Gly 1649 Gly Val Leu Ala Ala Leu Ala A a Tyr Cys Leu Ser Thr Gly Cys Val 1665 Val Ite Val Gly Ang Val Val Leu Sen Gly Lys Pho Ala Ite Ite Pho 1681 Asp Ang Glu Yal Leu Tyr Ang G . The Asp Glu Met Glu Glu Cys Ser 1697 Gin His Leu Pro Tyr I'le Glu G r G y Met Met Leu Ala Glu Gln Phe 1713 Lys Sin Lys Ala Leu Siy Leu Leu Sin Thr Ala Sen Ang Glin Ala Slu 1729 Yal Ile Ala Pro Ala Val Gin Thr Ash Tro Gin Lvs Leu Glu Thr Phe 1745 Trp Ala Lys His Met Trp Asn Phe Ile Ser Gly Ile Gin Tyr Leu Ala 1761 Gly Leu Ser Thr Leu Pro Gly Ash Pro Ala Ile Ala Ser Leu Met Ala 1777 Phe Thr Ala Ala Val Thr Ser Pro Leu Thr Thr Ser Gin Thr Leu Leu 1793 Phe Ash Ite Leu Gly Gly Tro Va. Ala Ala Gln Leu Ala Ala Pro Gly 1809 Ala Ala Thr Ala Phe Val Gly Ala Gly Leu Ala Gly Ala Ala Ile Gly 1825 Ser Val Gly Leu Gly Lys Val Leu Ile Asp Ile Leu Ala Gly Tyr Gly 1841 Ala Gly Val Ala Gly Ala Leu Val Ala Phe Lys Ile Met Ser Gly Giu 1857 Val Pro Ser Thr Glu Asp Leu Va Ash Leu Leu Pro Ala Ile Leu Ser 1873 Pro Gly Ala Leu Val Val Gly Val Val Cys Ala Ala Ile Leu Arg Arg 1889 His Val Gly Pro Gly Glu Gly Ala Val Gin Trp Met Asn Arg Leu Ile 1905 Ala Phe Ala Ser Ang Gly Asn His Val Ser Pro Thr His Tyr Val Pro 1921 Glu Ser Asp Ala Ala Ala Arg Val Thr Ala Ile Leu Ser Ser Leu Thr 1937 Val Thr Gln Leu Leu Arg Arg Leu His Gln Trp Ile Ser Ser Glu Sys 1953 Thr Thr Pro Cys Ser Gly Ser Trp Leu Arg Asp Ile Trp Asp Trp Ile 1969 Cys Glu Val Leu Ser Asp Phe Lys Thr Trp Leu Lys Ala Lys Leu Met 1985 Pro Gin Leu Pro Gly Ile Pro Phe Val Ser Cys Gin Arg Gly Tyr Lys 1005 Gly Val Trp Arg Val Asp Gly Ile Met His Thr Arg Cys His Cys Gly 2017 Ala Glu Ile Thr Gly His Val Lys Asn Gly Thr Met Arg Ile Val Gly 2033 Pro Ang Thr Cys Ang Asn Met Tro Ser Gly Thr Phe Pro Ile Asn Ala 2049 Tyr Thr Thr Gly Pro Cys Thr Ang Leu Pro Ala Pro Ash Tyr Thr Phe 2065 Ala Leu Trp Arg Val Ser Ala Glu Glu Tyr Val Glu Ile Arg Gln Val 1805 Gly Asp Phe His Tyr Val Thr Gly Met Thr Thr Asp Asn Leu Lys Cys 2097 Pro Cys Gln Val Pro Ser Pro Glu Phe Phe Thr Glu Leu Asp Gly Val Ang Leu His Ang Phe Ala Pro Pro Cys Lys Pro Leu Leu Ang Glu Glu 2129 Val Ser Phe Arg Val Gly Leu His Glu Tyr Pro Val Gly Ser Gln Leu

## FIG.1D

Pro Cys Glu Pro Glu Pro Asp Val Ala Val Leu Thr Ser Met Leu Thr Asp Pro Ser His Ite Thr Ala Glu Ala Ala Gly Arg Arg Leu Ala Arg 2193 Gly Sen Pro Pro Sen Val Ala Sen Sen Sen Ala Sen Glin Leu Sen Ala Pro Ser Leu Lys Ala Thr Cys Thr Ala Ash His Ash Ser Pro Asp Ala Glu Leu Ile Glu Ala Ash Leu Leu Trp Arg Gln Glu Met Gly Gly Ash 2225 Ile Thr Arg Val Glu Ser Glu Asn Lys Val Val Ile Leu Asp Ser Phe 2241 Asp Pro Leu Val Ala Glu Glu Asp Glu Arg Glu Ile Ser Val Pro Ala 2257 Glu Ile Leu Arg Lys Ser Arg Arg Phe Ala Gln Ala Leu Pro Val Trp Ala Arg Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr Trp Lys Lys Pro 2273 2299 Asp Tyr Glu Pro Pro Val Val His Gly Cys Pro Leu Pro Pro Pro Lys 2305 Ser Pro Pro Val Pro Pro Pro Arg Lys Lys Arg Thr Val Val Leu Thr 2321 Glu Ser Thr Leu Ser Thr Ala Leu Ala Glu Leu Ala Thr Ang Ser Phe 2337 Gly Sen Sen Sen Thr Sen Gly I e Thr Gly Asp Ash Thr Thr Thr Sen 2353 Sen Glu Pho Ala Pho Sen G ý Cys Pho Pho Aso Sen Aso Ala Glu Sen 2369 Fyn Sen Sen Met Pho Pho Leu Giu Gly Glu Pho Giy Asp Pho Asp Leu 2385 Sen Asp Gly Sen Inp Sen Thr Va Cen Cen Glu A à Ash Ala Glu Asp 2401 Val Val Cys Cys Sen Met Sen Tyn Sen Tho Thr G y Ala Cys Val Thr 2417 Pro Cys Ala Ala Giu Giu Gin Lis Leu Pro Ile Ash Ala Leu Sen Ash 2433 Ser Leu Leu Ang His His Ash Leu Yol Tyn Sen Thr Thr Sen Ang Sen 5446 2465 Ala Cys Gin Ang Gin Lys Lys Val. For Phe Asp Ang Leu Gin Val Leu Aso Sen His Tyn Gin Aso Va Leu Lys Giu Vai Lys Ala Ala Ala Sen 2481 Lys Val Lys Ala Asn Leu Leu Sen Val Glu Glu Ala Cys Sen Leu Thr Pro Pro His Ser Ala Lys Ser Lys The Bly Tyr Gly Ala Lys Asp Val Ang Cys His Ala Ang Lys Ala Val Thr His Ite Ash Ser Val Trp Lys 2529 2545 Asp Leu Leu Glu Asp Ash Va. The Pro Ite Asp The The Ite Met Ala Lys Ash Glu Val Phe Cys Val Gin Pro Glu Lys Gly Gly Ang Lys Pro Ala Ang Leu Ile Val Phe and Aso Leu Bly Val Ang Val Cys Glu Lys 2577 Met Ala Leu Tyn Asp Val Val Thr Lys Leu Pro Leu Ala Val Met Gly 2593 Ser Ser Tyr Gly Phe Gln Tyr Ser Pro Gly Gin Arg Val Glu Phe Leu 2609 Val Gin Ala Trp Lys Ser Lys Lys Thr Pro Met Gly Phe Ser Tyr Asp 2525 Thr Arg Cys Phe Asp Ser Thr Val Thr Glu Ser Asp Ile Arg Thr Glu Glu Ala Ile Tyr Gln Cys Cys Asp Leu Asp Pro Gln Ala Ang Val Ala Ile Lys Ser Leu Thr Glu Arg Leu Tyr Val Gly Gly Pro Leu Thr Asn 2673 Ser Ang Gly Glu Asn Cys Gly Tyr Ang Ang Cys Ang Ala Ser Gly Val 2689 Leu Thr Thr Ser Cys Gly Asn Thr Leu Thr Cys Tyr Ile Lys Ala Ang 2705 Ala Ala Cys Ang Ala Ala Gly Leu Gin Aso Cys Thr Met Leu Val Cys 2721 Gly Asp Asp Leu Val Val Ile Cys Glu Ser Ala Gly Val Gln Glu Asp 2737 Ala Ala Ser Leu Arg Ala Phe Thr Glu Ala Met Thr Arg Tyr Ser Ala 2753 Pro Pro Gly Asp Pro Pro Gln Pro Glu Tyr Asp Leu Glu Leu Ile Thr 2769 Ser Cys Ser Ser Asn Val Ser Val Ala His Asp Gly Ala Gly Lys Arg 2785 Val Tyr Tyr Leu Thr Arg Aso Pro Thr Thr Pro Leu Ala Arg Ala Ala 2801 Trp Glu Thr Ala Arg His Thr Pro Val Asn Ser Trp Leu Gly Asn Ile 2917 Ile Met Phe Ala Pro Thr Leu Trp Ala Arg Met Ile Leu Met Thr His 2833 Phe Phe Ser Val Leu Ile Ala Arg Asp Glin Leu Glu Glin Ala Leu Asp 2849 Cys Glu Ile Tyr Gly Ala Cys Tyr Ser Ile Glu Pro Leu Aso Leu Pro 2881 Pro Ite Ite Gin Ang Leu Giy Cys Pro Glu Ang Leu Ala Sen

Antibody binding to individual peptides and various mixtures in an







